Multiple-Criteria Approach for Serbian Tourism Products Assessment

Gabrijela Popović 1
Miodrag Brzaković 2
Darjan Karabašević 3
Srđan Novaković 4
Pavle Brzaković 5

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Abstract: The main intention of this paper is to emphasize the crucial tourism products that will contribute to the tourism development of the Republic of Serbia. With that aim, the Multiple-Criteria Decision-Making – MCDM approach is proposed based on the PIvot Pairwise RElative Criteria Importance Assessment – PIPRECIA and the Simple Weighted Sum Product – WISP methods. PIPRECIA method is applied for defining the criteria weights, while the WISP method is used for ranking the considered tourism products. The final results are reliable and the tourism product City break is emphasized as the one with the greatest potential.

1. INTRODUCTION

Decision-making in the tourism field is not less complex as it is in other business areas (Rigall-I-Torrent, & Fluvià, 2011). One of the questions that arise when it comes to decision-making in the mentioned area is what tourism product is the most attractive for the tourists. The attractiveness of the tourism products is affected by various factors which should be considered in the decision and evaluation process. For example, the Republic of Serbia in The strategy of the tourism development of the Republic of Serbia (“Službeni glasnik RS”, br. 91/2006) elicited nine crucial tourism products that could foster further tourism development. These alternative products were estimated against eleven criteria by using an adequate number of points. But, based on this it is very hard to clearly determine what product should be a priority because of its potential. In resolving this issue the application of the multiple-criteria approach would be very helpful.

Multiple-Criteria Decision-Making methods (MCDM) are very popular and used for the facilitation of decision-process in the various business fields as well as in the tourism field (Alptekin & Büyüközkan, 2011; Liu et al., 2012; Liu et al., 2013; Stević et al., 2019; Lin, 2020; Lin & Chang, 2020). So far, many different approaches are introduced. Although all of them have the same goal of facilitating the decision process, the reason for the continual proposal of the new methods reflects the researchers’ intention for finding the best possible technique that will give optimal and reliable results. In the present case, the approach based on the Pivot Pairwise...
RElative Criteria Importance Assessment – PIPRECIA and the Simple Weighted Sum Product – WISP is proposed for assessment of the aforementioned Serbian tourism products. The main reason for the application of these methods relies on their simplicity, ease of use and reliability.

2. PROPOSED METHODOLOGY

2.1. The PIPRECIA method

The first phase in the application of the MCDM methods is defining the criteria significance. There are a significant number of MCDM approaches dedicated to obtaining of the criteria weights, to name a few: The Entropy method (Shannon, 1948), the Analytic Hierarchy Process – AHP (Saaty, 1980), the Best-Worst Method – BWM (Rezaei, 2015, 2016), the Full Consistency Method – FUCOM (Pamučar et al., 2018) and the Stepwise Weight Assessment Ratio Analysis – SWARA (Keršuliene et al., 2010). In this case, the PIPRECIA method (Stanujkic et al., 2017) is applied for defining the criteria weights. The main reason for its usage relies in its simplicity and adequacy for using in the group decision-make environment.

The calculation procedure of the PIPRECIA method could be precisely illustrated by the following steps.

Step 1. Evaluation criteria selection. In the first step of the PIPRECIA method, there is no need for sorting the criteria according to the expected importance.

Step 2. Determination of the relative importance $s_j$, beginning from the second criterion, is as follows:

$$ s_j = \begin{cases} > 1 & \text{when } C_j > C_{j-1} \\ 1 & \text{when } C_j = C_{j-1} \\ < 1 & \text{when } C_j < C_{j-1} \end{cases} \quad (1) $$

Step 3. Determination of the coefficient $k_j$ as follows:

$$ k_j = \begin{cases} 1 & j = 1 \\ 2 - s_j & j > 1 \end{cases} \quad (2) $$

Step 4. Calculation of the recalculated value $q_j$, in the following manner:

$$ q_j = \begin{cases} 1 & j = 1 \\ \frac{q_{j-1}}{k_j} & j > 1 \end{cases} \quad (3) $$

Step 5. Determination of the relative criteria weights by using the following equation:

$$ w_j = \frac{q_j}{\sum_{k=1}^{n} q_k} \quad (4) $$

where $w_j$ denotes the relative weight of the criterion $j$.

Step 6. Determination of the relative criteria weights when the greater number of decision-makers are involved in the evaluation procedure. In that case, the overall criteria weights are defined in the following way:
where $w_{jr}$ is the weight of criterion $j$ that is defined by the respondent $r$, $R$ represents the total number of the respondents, $w_j^*$ is group weight of criterion $j$ before its adjusting in order to fulfill the condition $\sum_{j=1}^{n} w_j = 1$, and $w_j$ is the overall weight of criterion $j$.

### 2.2. The WISP method

The WISP method is introduced by Stanujkic et al. (2021) which incorporates four relationships between benefit and cost criteria in order to define a final utility of an alternative. Its procedure is very comprehensive and it successfully facilitates the decision process.

The computation procedure of this method could be represented by using the following steps.

**Step 1.** Creation of a normalized decision matrix. The normalized ratings are calculated in the following way:

$$ r_{ij} = \frac{x_{ij}}{\max_i x_{ij}} \quad (7) $$

where $r_{ij}$ is a dimensionless number that represents a normalized rating of alternative $i$ regarding the criterion $j$.

**Step 2.** Calculation of the values of four utility measures, by using the following equations:

$$ u_i^{wsd} = \sum_{j \in \Omega_{max}} r_{ij} w_j - \sum_{j \in \Omega_{min}} r_{ij} w_j \quad (8) $$

$$ u_i^{wpd} = \prod_{j \in \Omega_{max}} r_{ij} w_j - \prod_{j \in \Omega_{min}} r_{ij} w_j \quad (9) $$

$$ u_i^{wsr} = \frac{\sum_{j \in \Omega_{max}} r_{ij} w_j}{\sum_{j \in \Omega_{min}} r_{ij} w_j} \quad (10) $$

$$ u_i^{wpr} = \frac{\prod_{j \in \Omega_{max}} r_{ij} w_j}{\prod_{j \in \Omega_{min}} r_{ij} w_j} \quad (11) $$

where: $u_i^{wsd}$ and $u_i^{wpd}$ represent differences between the weighted sum and weighted product of normalized ratings of alternative $i$, respectively. Analogous to the previous one, $u_i^{wsr}$ and $u_i^{wpr}$ remarks ratios between weighted sum and weighted product of normalized ratings of alternative $i$, respectively.

**Step 3.** Recalculation of the values of four utility measures, as follows:

$$ \bar{u}_i^{wsd} = \frac{1+u_i^{wsd}}{1+u_i^{wsd}_{\max_i}} \quad (12) $$

$$ \bar{u}_i^{wpd} = \frac{1+u_i^{wpd}}{1+u_i^{wpd}_{\max_i}} \quad (13) $$
\[ \bar{u}_i^{wsd} = \frac{1 + u_i^{wsd}}{1 + u_{\text{max}}^{wsd}} \]  

\[ \bar{u}_i^{wpr} = \frac{1 + u_i^{wpr}}{1 + u_{\text{max}}^{wpr}} \]  

where: \( \bar{u}_i^{wsd}, \bar{u}_i^{wpr} \) and \( \bar{u}_i^{wpr} \) represents recalculated values of \( u_i^{sd}, u_i^{pd}, u_i^{sr} \) and \( u_i^{pr} \).

**Step 4.** Definition of the overall utility \( u_i \) of each alternative by using Eq. (16):

\[ u_i = \frac{1}{4} \left( \bar{u}_i^{wsd} + \bar{u}_i^{wpr} + \bar{u}_i^{wor} + \bar{u}_i^{wpr} \right) \]  

**Step 5.** Rank the alternatives in descending order and select the optimal one. The alternative which has the highest value of \( u_i \) is the best one.

### 3. NUMERICAL EXAMPLE

The application of the proposed approach is demonstrated through a real case study directed to the ranking of the tourism products of the Republic of Serbia. Tourism products that are submitted under evaluation are:

- \( A_1 \) – City break
- \( A_2 \) – Circular tours
- \( A_3 \) – Business tours
- \( A_4 \) – Spa/wellness
- \( A_5 \) – Mountains and lakes
- \( A_6 \) – Nautics
- \( A_7 \) – Events
- \( A_8 \) – Special interests
- \( A_9 \) – Rural tourism

The evaluation criteria are:

- \( C_1 \) – Threat from the new competition entrance
- \( C_2 \) – Threat from the substitutes
- \( C_3 \) – Competition intensity
- \( C_4 \) – Bargaining power on the customer side
- \( C_5 \) – Bargaining power on the supplier side
- \( C_6 \) – Demand volume
- \( C_7 \) – Potential of the growth of demand
- \( C_8 \) – Image creating
- \( C_9 \) – Speed of investment attraction
- \( C_{10} \) – The amount of investment required
- \( C_{11} \) – Technical and managerial complexity

Table 1 contains the initial assessment of the tourism products retrieved from The Strategy of the tourism development of the Republic of Serbia (“Službeni glasnik RS”, br. 91/2006), which represents the input data for further MCDM analysis.
First, the criteria weights are defined. Three-decision makers are involved in the procedure in order to gain adequate weighting results. The criteria weights according to decision-makers as well as the overall weights of criteria are shown in Table 2.

When the criteria weights are determined, the WISP method is applied. In Table 3 the recalculated values of four utility measures are presented, which are computed by using Eqs. (12) – (15).
The ranking order of the considered tourism products is defined by using Eq. (16) and presented in Table 4.

<table>
<thead>
<tr>
<th>Table 4. Ranking order of the alternatives</th>
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<tbody>
<tr>
<td>$u_i$</td>
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<tr>
<td>$A_1$</td>
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<td>$A_3$</td>
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<td>$A_1$</td>
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<td>$A_4$</td>
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<td>$A_8$</td>
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<td>$A_9$</td>
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Source: Own research

As Table 4 shows, the most significant tourism product in present conditions for the Serbian tourism sector is $A_1$ – City breaks.

4. CONCLUSION

The main target of this paper was to emphasize the crucial tourism products of the Republic of Serbia that should have adequate attention and that should be further developed. With that aim, the MCDM approach is proposed based on the PIPRECIA and WISP methods. PIPRECIA method is used for defining the criteria weights, while the WISP method is applied for the final ranking of the considered alternative tourism products. Nine tourism products are evaluated against the eleven criteria, and the decision process is performed by three decision-makers. The final results spot light on the alternative $A_1$ – City breaks as a tourism product that has the greatest potential and could greatly contribute to the tourism development of the Republic of Serbia.

The main limitation of this paper is expressed thorough application of the crisp numbers in the computational procedure. So, the first proposition for future research goes in favor of proposing adequate extensions based on the fuzzy, grey or neutrosophic numbers. Besides, if a greater number of decision-makers from the tourism field will be involved in the defining of the criteria weights, the obtained results would be more representative and reliable. Also, performing an additional analysis by using different MCDM models based on other combinations of the MCDM methods will enable confirmation of the obtained results.

Despite the outlined shortcomings of the given paper, the applicability of the proposed approach as well as the reliability of the gained results could not be refuted. The proposed model facilitates the evaluation process and decision-making is performed effectively. Obtained results are real and relevant and are in accordance with the present conditions.
REFERENCES


Službeni glasnik RS (91/2006). *The Strategy of the tourism development of the Republic of Serbia*

